

BAB V

KESIMPULAN DAN SARAN

A. Kesimpulan

Dari hasil penelitian dapat disimpulkan bahwa :

1. Proporsi xanthan gum yang lebih banyak pada perbandingan matriks antara xanthan gum dan HPMC K4M berpengaruh terhadap peningkatan waktu alir, yang berpengaruh pada kompaktibilitas. Sedangkan proporsi HPMC K4M yang lebih banyak dapat membantu memperlambat waktu disolusi.
2. Kombinasi matriks HPMC K4M dan Xantan Gum pada formula ke 3 menunjukkan formula yang optimum antara formula yg lain dengan HPMC 15% bagian dan Xantan Gum 30% bagian pada obat.

B. Saran

1. Perlu ditambahkan beberapa formula untuk mendapatkan formula yang lebih optimum.
2. Perlu dikembangkan dengan penggunaan bahan matrik yang lain.

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Lampiran 1. Kecepatan alir granul

$$\text{Rumus kecepatan alir} = \frac{\text{bobot granul}}{\text{waktu}}$$

Formula I

Replikasi	Waktu (detik)	Kecepatan alir
1	9,0	11,11
2	7,5	12,57
3	7,4	13,51
SD	0,8	1,209

Formula II

Replikasi	Waktu (detik)	Kecepatan alir
1	8,3	11,79
2	8,17	12,10
3	7,18	13,77
SD	0,612	1,065

Formula III

Replikasi	Waktu (detik)	Kecepatan alir
1	6,5	15,29
2	6,3	16,16
3	6,0	16,51
SD	0,25	0,628

Lampiran 2. Kadar Air

Formula I

Bobot (mg)	Waktu (detik)
200	5%
	5,5 %
	3,5 %
SD	1,04%

Formula II

Bobot (mg)	Waktu (detik)
200	3%
	2 %
	1 %
SD	1%

Formula III

Bobot (mg)	Waktu (detik)
200	0,5%
	0,5 %
	0,5 %
SD	0%

Lampiran 3.kekerasan

Kekerasan	Formula		
	I	II	III
	10	8,5	8
	9,5	8,5	8
	10	8,5	7
SD	0,28	0	0,57

Lampiran 4. Kerapuhan

Formula I

Bobot awal = 10,006 gram

Bobot akhir = 9,961

$$\% \text{ kerapuhan} = \frac{10,006 - 9,961}{10,006} \times 100 \% = 0,4\%$$

Formula II

Bobot awal = 9,936

Bobot akhir = 9,640

$$\% \text{ kerapuhan} = \frac{9,936 - 9,640}{9,936} \times 100 \% = 0,2\%$$

Formula III

Bobot awal = 9,925

Bobot akhir = 9,893

$$\% \text{ kerapuhan} = \frac{9,925 - 9,893}{9,925} \times 100 \% = 0,3\%$$

Lampiran 5. Keseragaman bobot

pengujian	formula I	formula II	formula III
1	493	497	499
2	496	495	500
3	497	498	503
4	491	496	495
5	496	490	501
6	491	494	502
7	500	500	495
8	501	499	502
9	506	491	495
10	494	497	500
11	494	497	496
12	503	490	494
13	494	497	501
14	500	494	498
15	492	495	497
16	494	500	496
17	491	493	495
18	495	500	503
20	498	484	500
rata-rata	496.1053	495.1053	498.5263
SD	4.267379	4.148557	3.061743
CV	0.860176	0.837914	0.614159

Lampiran 6. Penentuan panjang gelombang maksimum dan pembuatan kurva baku teofilin

Penentuan panjang gelombang maksimum

Panjang gelombang	Absorbansi
240,0	0,138
245,0	0,136
250,0	0,168
255,0	0,226
260,0	0,299
265,0	0,366
270,0	0,403
275,0	0,388
280,0	0,316
285,0	0,203
290,0	0,092
295,0	0,032
300,0	0,013
305,0	0,009
310,0	0,007

Panjang gelombang teofilin dalah 270 nm

Pembuatan larutan induk teofilin

Timbang teofilin sebanyak 200mg kemudian dilarutkan dalam medium dapar phospat 100ml, setelah itu pipet 1ml masukan kedalam labu ukur sampai 100ml kemudian di ad kan sampai batas atas.

Data kurva baku teofilin

Kadar (ppm)	Absorbansi
1	0,166
3	0,256
5	0,364
7	0,491
9	0,581
11	0,704
13	0,896

Data regresi linier

$$A = 0,0811$$

$$B = 0,0589$$

$$r = 0,9939$$

persamaan regresi linier $y = 0,0811 + 0,0589x$

Lampiran 7. Hasil disolusi

Rumus perhiungan kadar teofilin : $\frac{\text{kadar} \left(\frac{\text{mg}}{\text{ml}}\right) \times \text{volume media disolusi} \times fx}{\text{dosis teofilin dalam tablet}} \times 100 \%$

Formula I replikasi I

Waktu	absorbansi	kadar (ppm)	kadar (mg/ml)	kadar 500 ml	fx	kadar%
0	0	0	0	0	0	0
15	0.311	3.90322581	0.003903226	1.951612903	25	24.39516
30	0.365	4.82003396	0.004820034	2.410016978	25	30.12521
45	0.369	4.88794567	0.004887946	2.443972835	25	30.54966
60	0.373	4.95585739	0.004955857	2.477928693	25	30.97411
90	0.451	6.28013582	0.006280136	3.140067912	25	39.25085
120	0.5	7.11205433	0.007112054	3.556027165	25	44.45034
180	0.554	8.02886248	0.008028862	4.014431239	25	50.18039
240	0.574	8.36842105	0.008368421	4.184210526	25	52.30263
300	0.659	9.81154499	0.009811545	4.905772496	25	61.32216
360	0.688	10.3039049	0.010303905	5.151952462	25	64.39941

Formula I replikasi 2

Waktu	absorbansi	kadar ppm	kadar (mg/ml)	kadar 500ml	fx	kadar %
0						0
15	0.316	3.98811545	0.003988115	1.994057725	25	24.92572
30	0.387	5.19354839	0.005193548	2.596774194	25	32.45968
45	0.44	6.09337861	0.006093379	3.046689304	25	38.08362
60	0.48	6.77249576	0.006772496	3.386247878	25	42.3281
90	0.501	7.12903226	0.007129032	3.564516129	25	44.55645
120	0.501	7.12903226	0.007129032	3.564516129	25	44.55645
180	0.519	7.43463497	0.007434635	3.717317487	25	46.46647
240	0.577	8.41935484	0.008419355	4.209677419	25	52.62097
300	0.605	8.89473684	0.008894737	4.447368421	25	55.59211
360	0.777	11.8149406	0.011814941	5.907470289	25	73.84338

Formula I replikasi 3

Waktu	absorbansi	kadar ppm	kadar (mg/ml)	kadar 500ml	fx	kadar %
0						0
15	0.21	2.18845501	0.002188455	1.094227504	25	13.67784
30	0.232	2.56196944	0.002561969	1.28098472	25	16.01231
45	0.314	3.95415959	0.00395416	1.977079796	25	24.7135

60	0.327	4.17487267	0.004174873	2.087436333	25	26.09295
90	0.386	5.17657046	0.00517657	2.588285229	25	32.35357
120	0.403	5.46519525	0.005465195	2.732597623	25	34.15747
180	0.492	6.9762309	0.006976231	3.48811545	25	43.60144
240	0.522	7.48556876	0.007485569	3.74278438	25	46.7848
300	0.587	8.58913413	0.008589134	4.294567063	25	53.68209
360	0.735	11.1018676	0.011101868	5.550933786	25	69.38667

Formula II replikasi 1

Waktu	absorbansi	kadar (ppm)	kadar (mg/ml)	kadar 500 ml	fx	kadar %
0						0
15	0.23	2.52801358	0.002528014	1.264006791	25	15.80008
30	0.24	2.69779287	0.002697793	1.348896435	25	16.86121
45	0.246	2.79966044	0.00279966	1.399830221	25	17.49788
60	0.302	3.75042445	0.003750424	1.875212224	25	23.44015
90	0.322	4.08998302	0.004089983	2.044991511	25	25.56239
120	0.376	5.00679117	0.005006791	2.503395586	25	31.29244
180	0.394	5.31239389	0.005312394	2.656196944	25	33.20246
240	0.449	6.24617997	0.00624618	3.123089983	25	39.03862
300	0.53	7.62139219	0.007621392	3.810696095	25	47.6337
360	0.791	12.0526316	0.012052632	6.026315789	25	75.32895

Formula II replikasi 2

Waktu	absorbansi	kadar ppm	kadar (mg/ml)	kadar 500 ml	fx	kadar %
0		0				0
15	0.222	2.39219015	0.00239219	1.196095076	25	14.95119

30	0.264	3.10526316	0.003105263	1.552631579	25	19.40789
45	0.31	3.88624788	0.003886248	1.943123939	25	24.28905
60	0.399	5.39728353	0.005397284	2.698641766	25	33.73302
90	0.418	5.71986418	0.005719864	2.859932088	25	35.74915
120	0.434	5.99151104	0.005991511	2.995755518	25	37.44694
180	0.503	7.16298812	0.007162988	3.581494058	25	44.76868
240	0.569	8.28353141	0.008283531	4.141765705	25	51.77207
300	0.715	10.762309	0.010762309	5.381154499	25	67.26443
360	0.792	12.0696095	0.01206961	6.034804754	25	75.43506

Formula II replikasi 3

waktu	absorbansi	kadar ppm	kadar (mg/ml)	kadar 500ml	fx	kadar %
0						0
15	0.19	1.84889643	0.001848896	0.924448217	25	11.5556
30	0.258	3.00339559	0.003003396	1.501697793	25	18.77122
45	0.274	3.27504244	0.003275042	1.637521222	25	20.46902
60	0.302	3.75042445	0.003750424	1.875212224	25	23.44015
90	0.382	5.10865874	0.005108659	2.554329372	25	31.92912
120	0.4	3.75042445	0.003750424	1.875212224	25	23.44015
180	0.458	6.39898132	0.006398981	3.199490662	25	39.99363
240	0.505	7.19694397	0.007196944	3.598471986	25	44.9809
300	0.606	8.91171477	0.008911715	4.455857385	25	55.69822
360	0.777	11.8149406	0.011814941	5.907470289	25	73.84338

Formula III replikasi 1

Waktu	Absorbansi	kadar ppm	kadar (mg/ml)	kadar 500 ml	fx	kadar %
0						0
15	0.24	2.69779287	0.002697793	1.348896435	25	16.86121
30	0.28	3.37691002	0.00337691	1.688455008	25	21.10569
45	0.261	3.05432937	0.003054329	1.527164686	25	19.08956
60	0.264	3.10526316	0.003105263	1.552631579	25	19.40789
90	0.275	3.29202037	0.00329202	1.646010187	25	20.57513
120	0.347	4.51443124	0.004514431	2.25721562	25	28.2152
180	0.503	7.16298812	0.007162988	3.581494058	25	44.76868
240	0.509	7.26485569	0.007264856	3.632427844	25	45.40535
300	0.6	8.8098472	0.008809847	4.404923599	25	55.06154
360	0.759	11.5093379	0.011509338	5.75466893	25	71.93336

Formula III replikasi 2

Waktu	absorbansi	kadar ppm	kadar (mg/ml)	kadar 500ml	fx	kadar %
0						0
15	0.256	2.96943973	0.00296944	1.484719864	25	18.559
30	0.296	3.64855688	0.003648557	1.824278438	25	22.80348
45	0.329	4.20882852	0.004208829	2.104414261	25	26.30518
60	0.358	4.70118846	0.004701188	2.350594228	25	29.38243
90	0.366	4.83701188	0.004837012	2.418505942	25	30.23132
120	0.381	5.09168081	0.005091681	2.545840407	25	31.82301
180	0.413	5.63497453	0.005634975	2.817487267	25	35.21859
240	0.444	6.16129032	0.00616129	3.080645161	25	38.50806
300	0.671	10.0152801	0.01001528	5.007640068	25	62.5955
360	0.834	12.7826825	0.012782683	6.391341256	25	79.89177

Formula III replikasi 3

Waktu	absorbansi	kadar ppm	kadar (mg/ml)	kadar 500ml	fx	kadar %
0						0
15	0.14	1	0.001	0.5	25	6.25
30	0.212	2.22241087	0.002222411	1.111205433	25	13.89007
45	0.213	2.23938879	0.002239389	1.119694397	25	13.99618
60	0.245	2.78268251	0.002782683	1.391341256	25	17.39177
90	0.266	3.13921902	0.003139219	1.569609508	25	19.62012
120	0.388	5.21052632	0.005210526	2.605263158	25	32.56579
180	0.444	6.16129032	0.00616129	3.080645161	25	38.50806
240	0.535	7.70628183	0.007706282	3.853140917	25	48.16426
300	0.703	8.58913413	0.008589134	4.294567063	25	53.68209
360	0.869	13.37691	0.01337691	6.688455008	25	83.60569

Rata-rata kadar setiap formula

WAKTU	Formula I	Formula II	Formula III
0	0	0	0
15	20.9995756	14.102292	13.89006791
30	26.1990662	18.3467742	19.266412
45	31.1155914	20.7519808	19.79697227
60	33.1317204	26.8711092	22.0606961
90	38.7202886	31.0802207	23.47552349
120	41.0547538	30.7265139	30.8679966
180	46.7494341	39.3215903	39.49844369
240	50.569468	45.2638653	44.02589134
300	56.8654499	56.8654499	57.11304471
360	69.2098189	74.8691285	78.47693831

Perhitungan disolusi efisiensi

menit	F1			F2			F3	
	rep1	rep2	rep3	rep1	rep2	rep3	rep1	rep2
0	0	0	0	0	0	0	0	0
15	24.3951613	24.9257216	13.6778438	15.80008489	15.80008	11.5556	16.86121	18.559
30	30.1252122	32.4596774	16.012309	16.86120543	16.86121	18.77122	21.10569	22.80348
45	30.5496604	38.0836163	24.71349745	17.49787776	17.49788	20.46902	19.08956	26.30518
60	30.9741087	42.3280985	26.09295416	23.4401528	23.44015	23.44015	19.40789	29.38243
90	39.2508489	44.5564516	32.35356537	25.56239389	25.56239	31.92912	20.57513	30.23132
120	44.4503396	44.5564516	34.15747029	31.29244482	31.29244	23.44015	28.2152	31.82301
180	50.1803905	46.4664686	43.60144312	33.2024618	33.20246	39.99363	44.76868	35.21859
240	52.3026316	52.6209677	46.78480475	39.03862479	39.03862	44.9809	45.40535	38.50806
300	61.3221562	55.5921053	53.68208829	47.63370119	47.6337	55.69822	55.06154	62.5955
360	64.3994058	73.8433786	69.38667233	75.32894737	75.32895	73.84338	71.93336	79.89177
Disolusi efisiensi								
0								
15	182.96371	186.942912	102.5838285	118.5006367	118.5006	86.66702	126.459	139.1925
30	408.902801	430.390492	222.676146	244.9596774	244.9597	227.4512	284.7517	310.2186
45	455.061545	529.074703	305.4435484	257.6931239	257.6931	294.3018	301.4643	368.3149
60	461.428268	603.087861	381.0483871	307.0352292	307.0352	329.3188	288.7309	417.657
90	1053.37436	1303.26825	876.6977929	735.0382003	735.0382	830.539	599.7453	894.2063
120	1255.51783	1336.69355	997.6655348	852.8225806	852.8226	830.539	731.8548	930.8149
180	2838.9219	2730.68761	2332.767402	1934.847199	1934.847	1903.014	2189.516	2011.248
240	3074.49066	2972.62309	2711.587436	2167.232598	2167.233	2549.236	2705.221	2211.8
300	3408.74363	3246.39219	3014.006791	2600.169779	2600.17	3020.374	3014.007	3033.107
360	3771.64686	3883.06452	3692.062818	3688.879457	3688.879	3886.248	3809.847	4274.618
total	16911.0516	17222.2252	14636.53969	12907.17848	12907.18	13957.69	14051.6	14591.18
luas total	36000	36000	36000	36000	36000	36000	36000	36000
DE	46.9751433	47.8395144	40.65705468	35.85327356	35.85327	38.77136	39.03221	40.53105
Rata-rata	45.1572374			36.82596739			39.37929	

Lampiran 8. Keseragaman kandungan

Replikasi	formula I	formula II	formula III
1	100,12%	101,40%	98,42%
2	99,70%	100,97%	98,85%
3	101,8%	97,16%	100,55%
SD	1,11 %	2,3 %	1,12 %

Lampiran 9. Persamaan simplex lattice design

a. Proporsi formula

Select	Std	Run	Component 1 A:HPMC mg	Component 2 B:xantan gum mg	Response 1 krs kg	Response 2 kerph %	Response 3 walir detik	Response 4 dayaserap %	Response 5 de %
1		1	75.000	150.000	9.5		6.5	0.5	38.5746
		2	75.000	150.000	9.5		6.2	0.5	39.0322
		3	75.000	150.000	10		6.1	0.5	40.531
		4	112.500	112.500	8.5		8	3	35.8533
		5	112.500	112.500	8.5		8	2	35.8533
		6	112.500	112.500	8.5		7	1	38.7714
		7	150.000	75.000	7		9	5	40.6571
		8	150.000	75.000	7		8	5.5	47.8395
		9	150.000	75.000	8		7.4	3.5	46.9751

b. Analisis

To analyze this response, click on the above icons in succession.

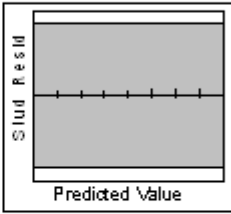
Transformation

- None
- Square Root
- Natural Log
- Base 10 Log
- Inverse Sqrt
- Inverse
- Power
- Logit
- ArcSin Sqrt

Equation

None (lambda = 1.0)

$y' = y$

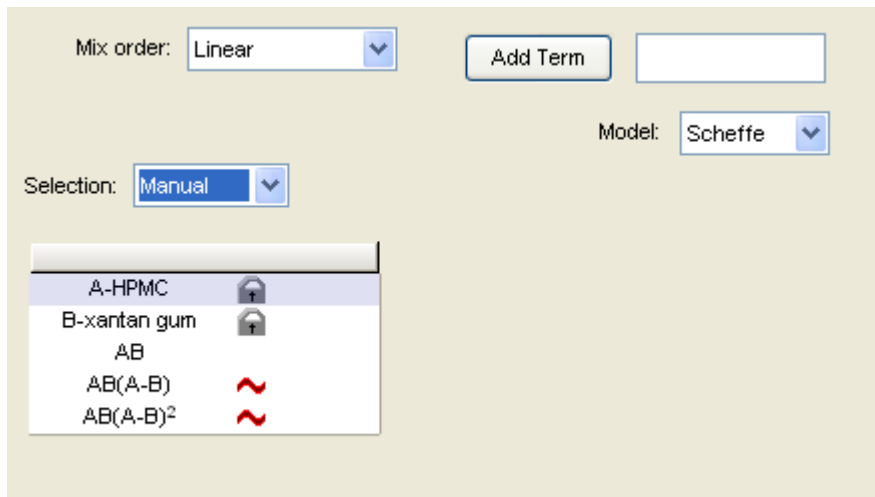


Use with a typical response.

Coding for Analysis: Pseudo

Response ranges from 7 to 10.
Ratio of max to min is 1.42857

A ratio greater than 10 usually indicates a transformation is required. For ratios less than 3 the power transforms have little effect.

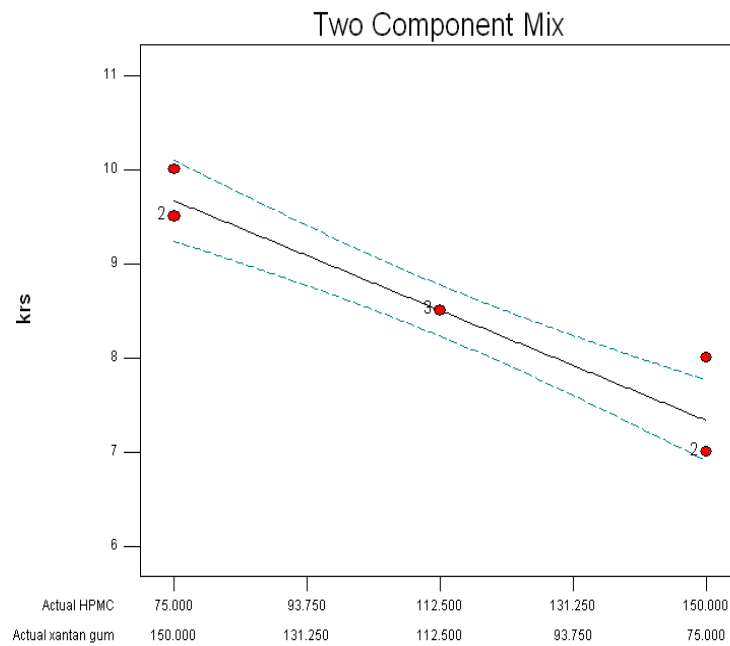


c. Model grafik

Design-Expert® Software
 Component Coding: Actual
 krs

— CI Bands
 ● Design Points

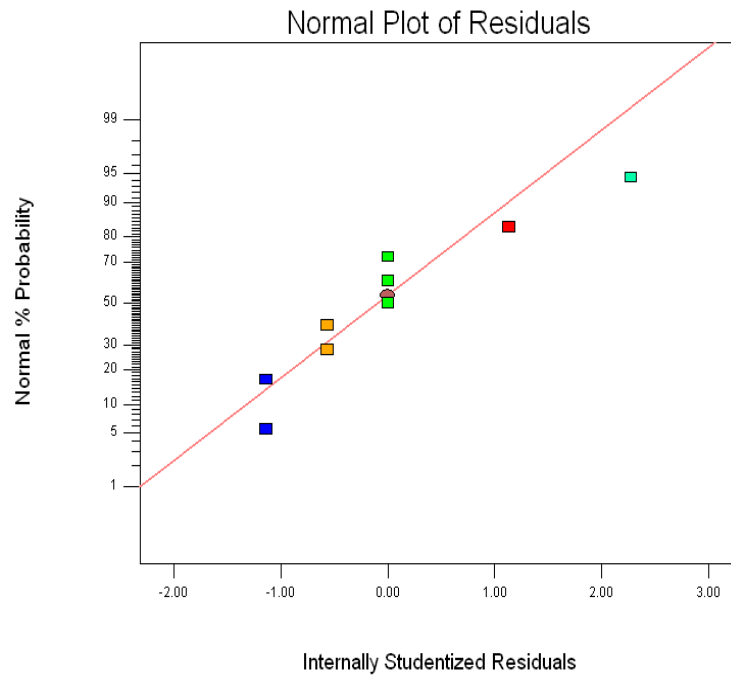
X1 = A: HPMC
 X2 = B: xantan gum



d. Diagnosis

Design-Expert® Software
krs

Color points by value of
krs:
10
7



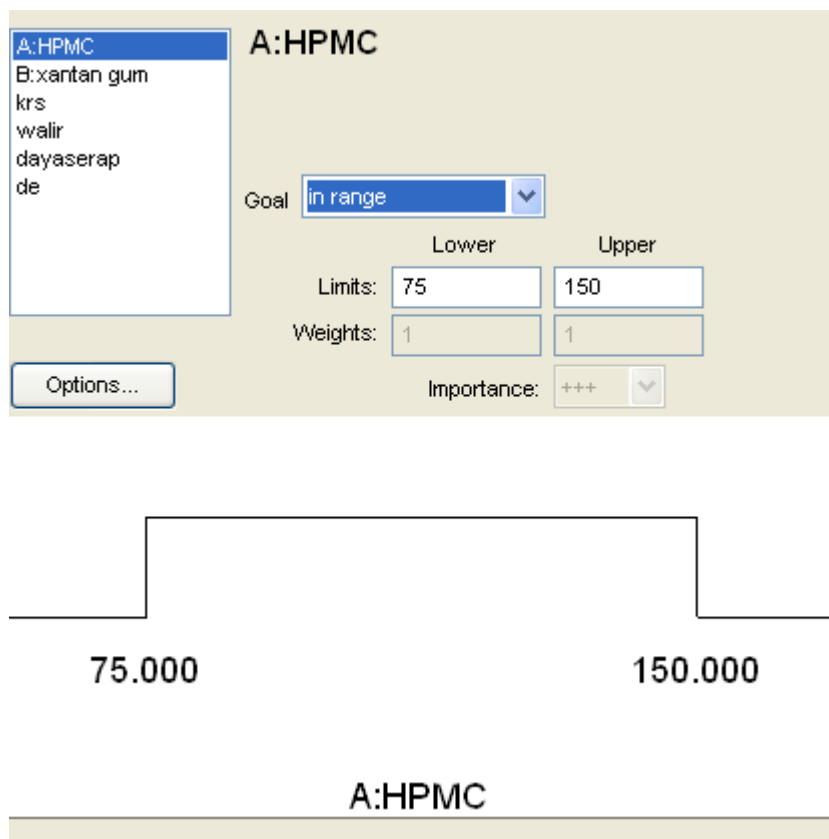
e. Formula optimum

name	Goal	Lower Limit	Upper Limit	Lower Weight	Upper Weight	Importance
%:HPMC	is in range	75	150	1	1	3
%:xantan gum	is in range	75	150	1	1	3
krs	is in range	7	10	1	1	3
%:walir	is in range	6.1	9	1	1	3
de	maximize	35.8533	47.8395	1	1	3

Solutions

Number	HPMC	xantan gum	krs	walir	de	Desirability	
1	<u>150.000</u>	<u>75.000</u>	<u>7.33333</u>	<u>8.28889</u>	<u>45.1572</u>	<u>0.776</u>	<u>Selected</u>
2	75.000	150.000	9.66667	6.42222	39.3793	0.294	

f. Kriteria formula optimum

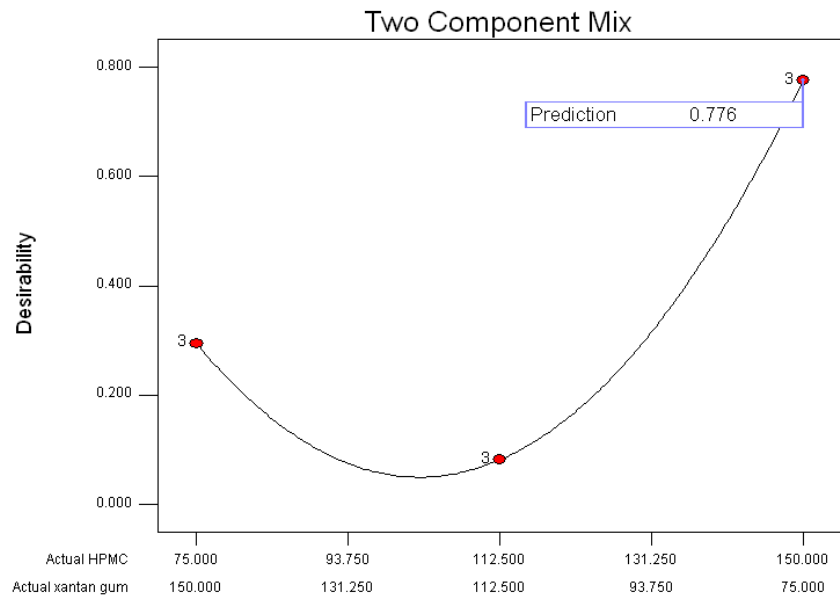


g. Grafik formula optimum

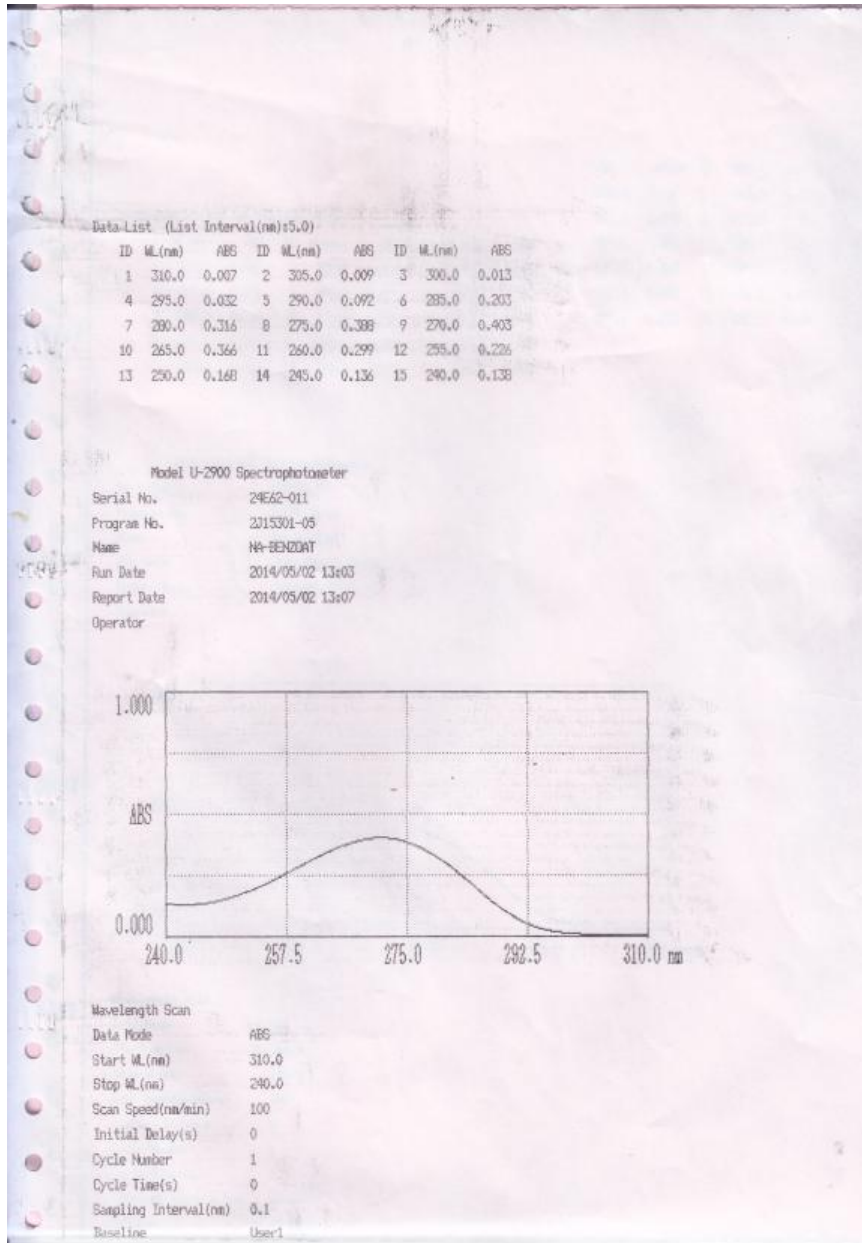
Design-Expert® Software
 Component Coding: Actual
 Desirability

◆ Design Points

X1 = A: HPMC
 X2 = B: xantan gum



Lampiran 10. Hasil penetapan panjang gelombang maksimum teofilin dalam medium dapar phospat.



Lampiran 11. Penentuan kurva larutan baku teofilin dalam medium dapar phospat

